

**Low Cost**  
**Dc to 2 MHz**  
**Sampling to 1 GHz**  
**Choice of 16 Plug-Ins**  
**Rear Panel Signal Outputs Optional**

### 5110

The 5110 is a single-beam nonstorage oscilloscope featuring a large 6½" diagonal (1.27 cm/div) crt.

Tailor your measurement needs with the appropriate plug-in units to obtain high-gain differential (10 μV/div), four-channel differential at 50 μV/div, eight-channel displays at 1 mV/div. Or choose from our extra low cost basic amplifier and time-base plug-ins to suit the special needs of education and industry.

When using two amplifiers and a dual time-base plug-in in the dual-sweep mode, the sweeps are slaved to the amplifiers.

#### CRT AND DISPLAY FEATURES

Crt — Internal 8 x 10 div (1.27 cm/div) parallax-free, non-illuminated graticule.\*

Accelerating Potential — 3.5 kV.

Phosphor — P31 standard, P7 or P11 optional.

### 5111

The 5111 is a single-beam, split-screen, bistable storage oscilloscope with a large-screen, 6½" diagonal (1.27 cm/div) display.

The 5111 extends measurement capability into areas requiring retention of single and multitrace displays for long-term examination and/or photography.

The 5111 is particularly useful for recording low and medium speed displays like those found in audio spectrum analysis, semiconductor curve tracing, sampling, vibration analysis, and the biophysical sciences.

When using two amplifiers and a dual time-base plug-in in the dual-sweep mode, the sweeps are slaved to the amplifiers.

#### CRT AND DISPLAY FEATURES

Crt — Internal 8 x 10 div (1.27 cm/div) parallax-free, non-illuminated graticule.\*

Accelerating Potential — 3.5 kV.

Phosphor — Similar to P1.

Max Stored Writing Speed — At least 20 div/ms.

Storage View Time — At least 1 hr at normal intensity; up to 10 hr at reduced intensity, after which time it may be increased to original level.

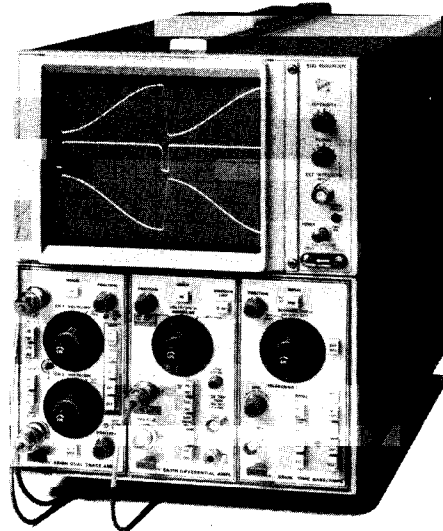
Erase Time — Approx 250 ms.

### 5112

The 5112 is a dual-beam nonstorage oscilloscope featuring two independent vertical systems referenced against a common horizontal deflection system.

The 5112 can display two simultaneous events, either single-shot or repetitive, against a common time base within the bandwidth and writing rate limits of the system. *Both beams are driven by one set of horizontal deflection plates.*

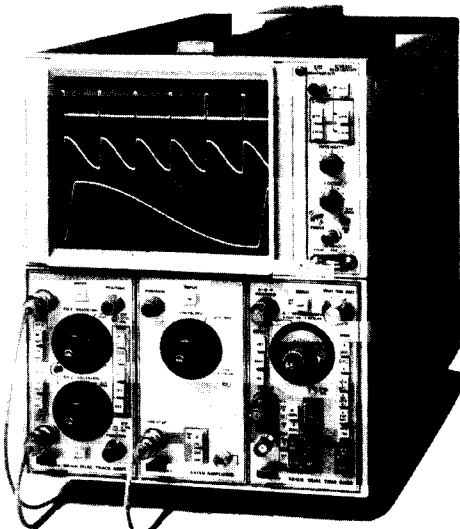
### 5110



**Lowest Cost Single-beam Nonstorage Oscilloscope with Plug-in Configurability**

**8 Channels at 1 mV/div, 4 Channels at 50 μV/div, 2 Channels at 10 μV/div, with Appropriate Amplifiers**

### 5111



**Single-beam Storage Oscilloscope Bistable, Split-screen Display**

**Stored Writing Speed ≥ 20 div/ms**

**Storage View Time up to 10 hrs at Reduced Intensity**

When teamed up with the appropriate differential amplifiers, the 5112 can display up to four channels of high-gain (50 μV) differential information for use in the biophysical, electromechanical, and component testing fields.

#### CRT AND DISPLAY FEATURES

Crt — Internal 8 x 10 div (1.27 cm/div) parallax-free, non-illuminated graticule.\*

Accelerating Potential — 3.5 kV.

Phosphor — P31 standard, P7 or P11 optional.

### 5113

The 5113 is a dual-beam bistable storage oscilloscope featuring easy-to-use split-screen storage. Stored writing speed is at least 20 div/ms (Option 03 provides 200 div/ms for the center 6 x 8 div). View time is at least 1 hr at normal intensity and can be increased to 10 hr at reduced intensity.

The 5113 can display two simultaneous events, either single-shot or repetitive, against a common time base within the bandwidth and writing rate limits of the system. *Both beams are driven by one set of horizontal deflection plates.*

The 5113 is particularly useful in biomedical research where low-repetition-rate stimulus/response potentials need to be observed and recorded.

#### CRT AND DISPLAY FEATURES

Crt — Internal 8 x 10 div (1.27 cm/div) parallax-free, non-illuminated graticule.\*

Accelerating Potential — 3.5 kV.

Phosphor — Similar to P1.

Max Stored Writing Speed — At least 20 div/ms. At least 200 div/ms at lower stored brightness (over center 6 x 8 div) with Option 03.

Storage View Time — At least 1 hr at normal intensity; up to 10 hr at reduced intensity, after which time it may be increased to original level.

Erase Time — Approx 250 ms.

Option 03 Fast Writing Speed Crt — Increases stored writing speed to 200 div/ms (center 6 x 8 div).

### 5115

The 5115 is a single-beam bistable storage oscilloscope with a writing speed of at least 200 div/ms in the normal mode and 800 div/ms (>1000 cm/ms) in the enhanced mode. Storage view time is at least 1 hr at normal intensity. A variable brightness control allows the storage time to be extended to at least 10 hrs at reduced intensity, after which time intensity may be increased to original level. Variable brightness also gives optimum photographic results and allows for the integration of multiple traces.

The 5115 is useful in a wide variety of fields, including education, biophysical engineering, component testing, and industrial electronics.

When using two amplifiers and a dual time-base plug-in in the dual-sweep mode, the sweeps are slaved to the amplifiers.

#### CRT AND DISPLAY FEATURES

Crt — Internal 8 x 10 div (1.27 cm/div) parallax-free, non-illuminated graticule.\*

Accelerating Potential — 3.5 kV.

Phosphor — Similar to P1.

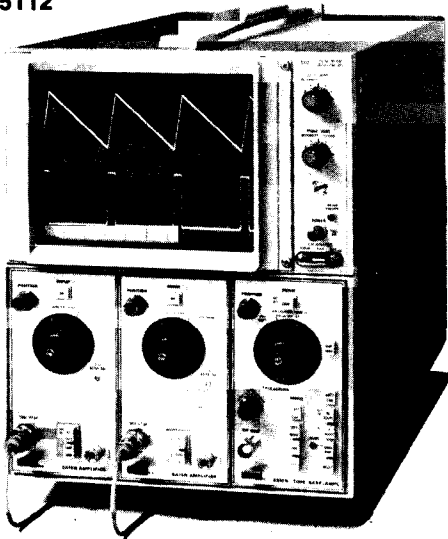
Max Stored Writing Speed — At least 200 div/ms in the normal-mode and 800 div/ms in the enhanced mode.

Storage View Time — At least 1 hr at normal intensity; up to 10 hr at reduced intensity, after which time it may be increased to original level.

Erase Time — Approx 250 ms.

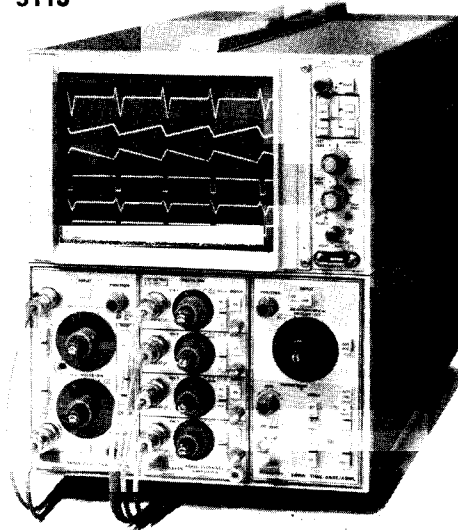
\*Illuminated graticule available at extra cost.

5112



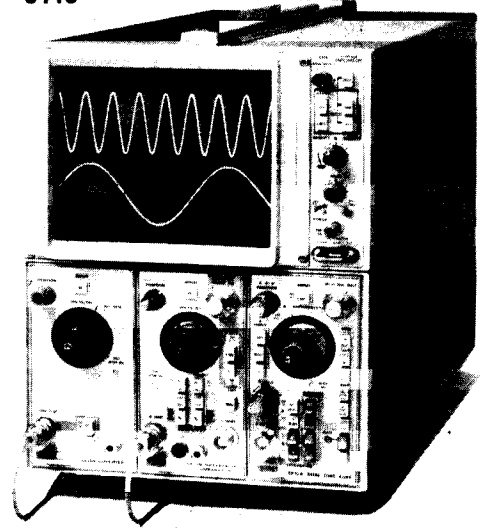
**Dual-beam Nonstorage Oscilloscope**  
**Two Independent Vertical Systems**  
**Common Horizontal Deflection System**  
**Can Display Two Single-shot Signals**  
**without Time-sharing, or up to Eight**  
**Signals in the CHOP Mode**

5113



**Dual-beam Bistable Storage Oscilloscope**  
**Same Features as 5112, Plus Split-screen**  
**Storage. Stored Writing Speed  $\geq 20$**   
**div/ms, or  $\geq 200$  div/ms with Option 03**

5115



**Single-beam Bistable Storage Oscilloscope**  
**Fastest Stored Writing Speed in the 5100-**  
**Series Line:**  
 $\geq 200$  div/ms in Normal-Mode  
 $\geq 800$  div/ms in Enhanced Mode  
**Storage View Time up to 10 hrs at Reduced**  
**Intensity**

**COMMON CHARACTERISTICS**

for 5110, 5111, 5112, 5113, 5115  
 unless otherwise specified

**VERTICAL SYSTEM**

**Channels** — Left and center plug-in compartments compatible with all 5100-Series Plug-ins.

**Deflection Factor** — Determined by plug-in.

**Bandwidth** — 2 MHz max.

**Chopped Mode** — (5110, 5111, 5115) The mainframe vertical amplifier will chop between left and center plug-in compartments, and/or between two or more amplifier channels. The total time segment per channel is  $\approx 5 \mu\text{s}$ , consisting of  $\approx 3 \mu\text{s}$  displayed,  $\approx 2 \mu\text{s}$  blanked. Chop or alternate mode is selected at the time base unit.

**Chopped Mode** — (5112, 5113) The left and right mainframe vertical amplifiers are dedicated to the left and center plug-in compartments. Each mainframe vertical amplifier will chop between two or more channels in their associated plug-in compartments. No channel switching is necessary between left and center plug-in compartments. The total time segment per channel is  $\approx 5 \mu\text{s}$ , consisting of  $3 \mu\text{s}$  displayed,  $\approx 2 \mu\text{s}$  blanked. Chop or alternate mode is selected at the time base unit.

**Alternate Mode** — (5110, 5111, 5115) Each amplifier plug-in is swept twice before switching to the next. A single-trace amplifier is swept twice and each channel of a dual-trace amplifier is swept once before switching to the second amplifier.

**Alternate Mode** — (5112, 5113) Single-trace amplifiers are swept full time. Each channel of a multitrace amplifier is swept once before switching to the next channel. No channel switching is necessary between left and center plug-in compartments.

**HORIZONTAL SYSTEM**

**Channel** — Right-hand plug-in compartment compatible with all 5100-Series Plug-ins.

**Fastest Calibrated Sweep Rate** —  $0.1 \mu\text{s}/\text{div}$  (X10 mag) with 5B10N or 5B12N.

**X-Y Mode** — Phase shift within  $1^\circ$  from dc to 100 kHz.

**OPTIONAL REAR PANEL SIGNAL OUTPUTS**

**Left and Center Compartments** — Two BNC connectors provide access to the crt-related signals from the left and center plug-in amplifiers. Sensitivity: 0.5 V/crt division. Output Impedance: 1 k $\Omega$ .

**Right Compartment (Sweep)** — One BNC connector provides access to the crt-related sweep waveform. Sensitivity: 0.5 V/crt division; positive-going sawtooth,  $\geq 5$  V. Output Impedance: 1 k $\Omega$ .

**Right Compartment (Gate)** — One BNC connector provides access to TTL compatible gate. Positive-going, coincident with displayed sweep.

**X-Y Mode** — Crt related X-Y signals are available at the appropriate rear panel connectors when amplifier plug-ins are used in either the left or center compartment and the right compartment to display X-Y information. Sensitivity (X-Y): 0.5 V/crt division. Order Option 07.

**OTHER CHARACTERISTICS**

**Ambient Temperature** — Performance characteristics valid from  $0^\circ\text{C}$  to  $+50^\circ\text{C}$ .

**Line Voltage Ranges** — 100, 110, 120, 200, 220, and 240 V ac  $\pm 10\%$ ; (Except that max input should not exceed 250 V ac.) Internally selected with quick change jumpers. Line frequency range, 48 to 440 Hz.

**Typical Power Consumption** — For 5110, 53 W. For 5111, 74 W. For 5112, 67 W. For 5113, 88 W. For 5115, 74 W.

**External Intensity Input** — +5 V turns beam on from off condition. -5 V turns beam off from on condition. Frequency range dc to 1 MHz. Input R and C is approx 10 k $\Omega$  paralleled by approx 40 pF. Max input  $\pm 50$  V (dc + peak ac).

**Calibrator** — Voltage output 400 mV within 1%. Current output (loop) 4 mA within 1%. Frequency is 2 times line frequency.

**Beam Finder** — Positions beam on screen regardless of vertical and horizontal position control settings.

**ORDERING INFORMATION**

(Plug-ins not Included)

<b>Cabinet Model</b>	
5110 Oscilloscope	.....\$795
5111 Oscilloscope	.....\$1490
5112 Oscilloscope	.....\$1360
5113 Oscilloscope	.....\$2025
5115 Oscilloscope	.....\$1565
<b>Rackmount Model</b>	
R5110 Oscilloscope	.....\$845
R5111 Oscilloscope	.....\$1540
R5112 Oscilloscope	.....\$1410
R5113 Oscilloscope	.....\$2075
R5115 Oscilloscope	.....\$1615

**OPTIONS**

<b>Option 02 Protective Panel Cover (Cabinet Models Only)</b> — The cover protects the front panel and knobs during transportation and storage	.....Add \$25
<b>Option 03 Fast Writing Speed Crt (5113, R5113 Only)</b>	.....Add \$100
<b>Option 07 Add Rear Panel Signals Out (All Models)</b>	.....Add \$75
<b>Option 78 P7 Phosphor (5110, R5110, 5112, R5112 Only)</b>	.....Add \$35
<b>Option 78 P11 Phosphor (R110, R5110, 5112, R5112 Only)</b>	.....Add \$35

**CONVERSION KITS**

<b>Cabinet-to-Rackmount Conversion Kit, Order 040-0583-02</b>	.....\$105
<b>Rackmount-to-Cabinet Conversion Kit, Order 040-0584-03</b>	.....\$85
<b>Protective Panel Cover Kit, Order 040-0620-00</b>	.....\$25

**For Recommended Cameras** — See camera section, page 209.